Lumineq® Bus Adapter
Script Manual

Table of contents:

1 Overview

Lumineq® Bus adapter (LBA) is a multi-purpose interface card including excess amount of connections / ports that may or may not be utilized in different assemblies. The nature of the card in current physical outline is highly towards demo/prototyping/easy access rather than being highly integrated end production device.

This document describes how to write and upload display scripts. Script generates static content for LBA to show on display driven by ELT40S electronics. Examples and usage hints of different commands is provided at Chapter 5.

1.1 Prerequisites

Before starting please make sure that following conditions are met and required hardware is available:

1) 64-bit PC running Windows 7/10 operating system

2) Lumineq Bus Adapter running the script firmware

3) Lumineq Loader PC Application (LLA)

4) USB micro B cable
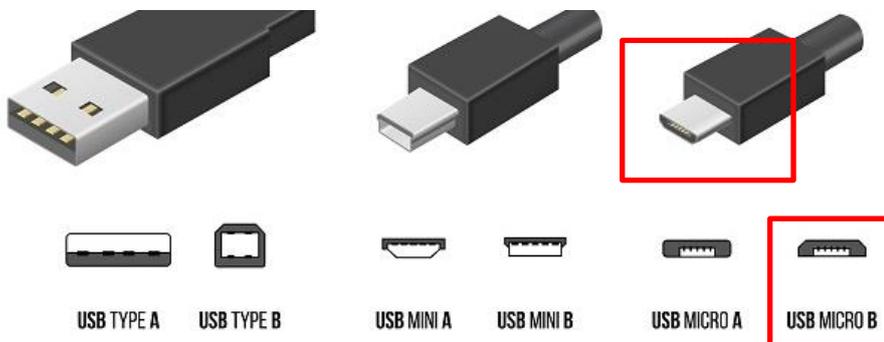
Note that the USB connector on CPU board of the LBA may be covered with a yellow protection tape. The tape can be removed and disposed.

2 Loader Application

The executable file is self-extracting archive which automatically unpacks the required system files to a temporary system directory without any needed actions from the user. Depending of the system the extraction may take some time and user may be informed about the process. Automatic extraction process may trigger false positive alert from antivirus and security suite applications. After proper launch following start-up screen is shown.
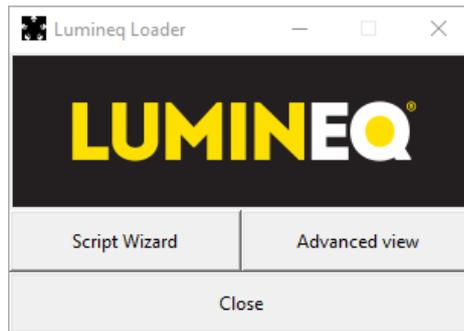
Figure 1. Lumineq Loader Application main screen.

The application is intended only for product development purposes and utilizes USB Descriptors provided by Cypress Semiconductor.

2.1 Script Wizard

Script Wizard is the recommended method of uploading a script file to LBA. Most of the required actions, such as communication port probing and opening, are performed automatically. Script upload procedure is described in chapter 3.1.

2.2 Advanced view

Advanced view provides more features such as support for checking software version and verifying script execution memory area validity through CRC check. In addition to Script Wizard, Advanced view also provides more feedback to user about the activities. In some cases Advanced view mode may be able to provide hints about possible syntax spelling mistakes or other issues related to script file. LLA version number is displayed at the title bar of the window.

Beneq Oy
Olarinluoma 9
FI-02200 Espoo
Finland

Tel. +358 9 7599 530
Fax +358 9 7599 5310
lumineq@beneq.com

VAT ID FI19563372
www.beneq.com
www.lumineq.com

Date: October 2, 2019   Document number: ED001499B   Page | 4
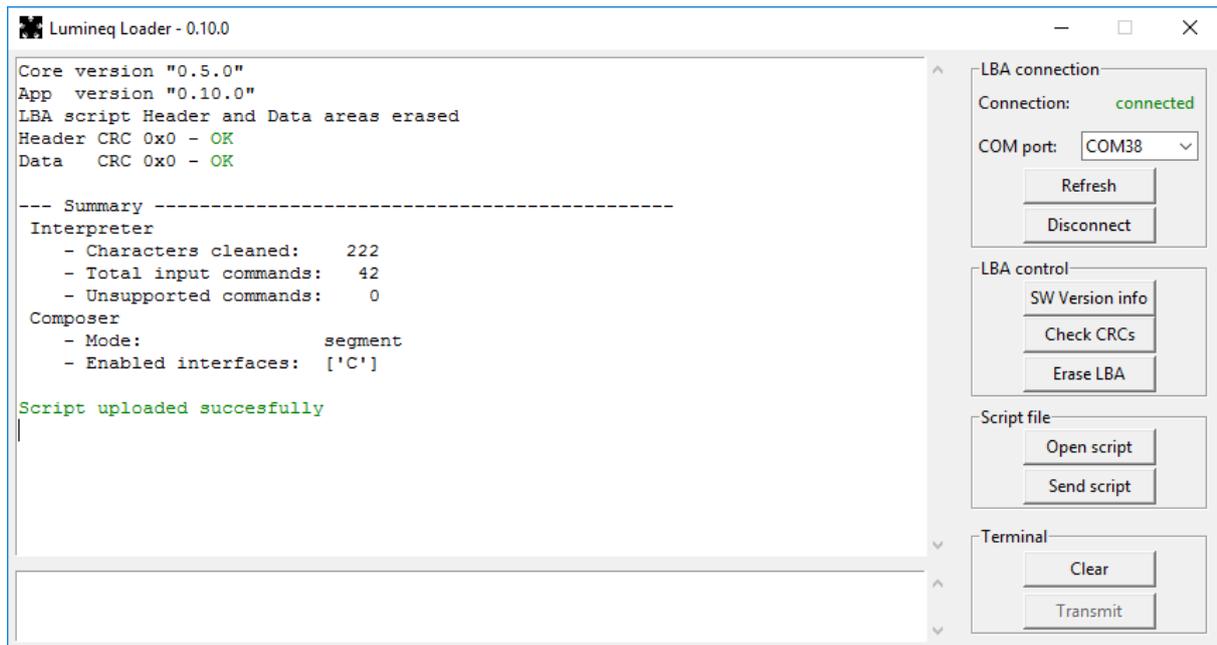
Figure 2. Lumineq Loader Application Advanced view. Note the version number information at the title bar (0.10.0).

3   Script uploading

3.1   Script Wizard

1) **Disconnect** all cables from LBA to make sure that no power is supplied to the board.

2) **Start** Lumineq Loader application

3) **Connect** the micro USB cable into the connector on CPU board of LBA

Figure 3. USB cable attached to the CPU board of LBA.

4) On LLA main screen, click **Script Wizard**

Beneq Oy
Olarinluoma 9
FI-02200 Espoo
Finland

Tel. +358 9 7599 530
Fax +358 9 7599 5310
lumineq@beneq.com

VAT ID FI19563372
www.beneq.com
www.lumineq.com

Date: October 2, 2019   Document number: ED001499B   Page | 5
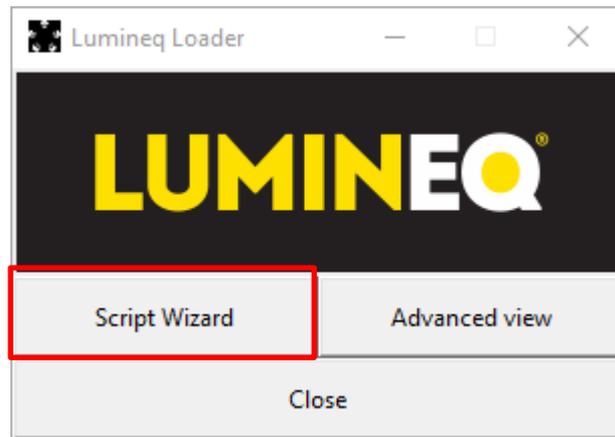
Figure 4. LLA main screen.

LLA automatically attempts to establish a connection to LBA. If connection was established successfully, following dialog is shown asking user to select the script file to be uploaded.
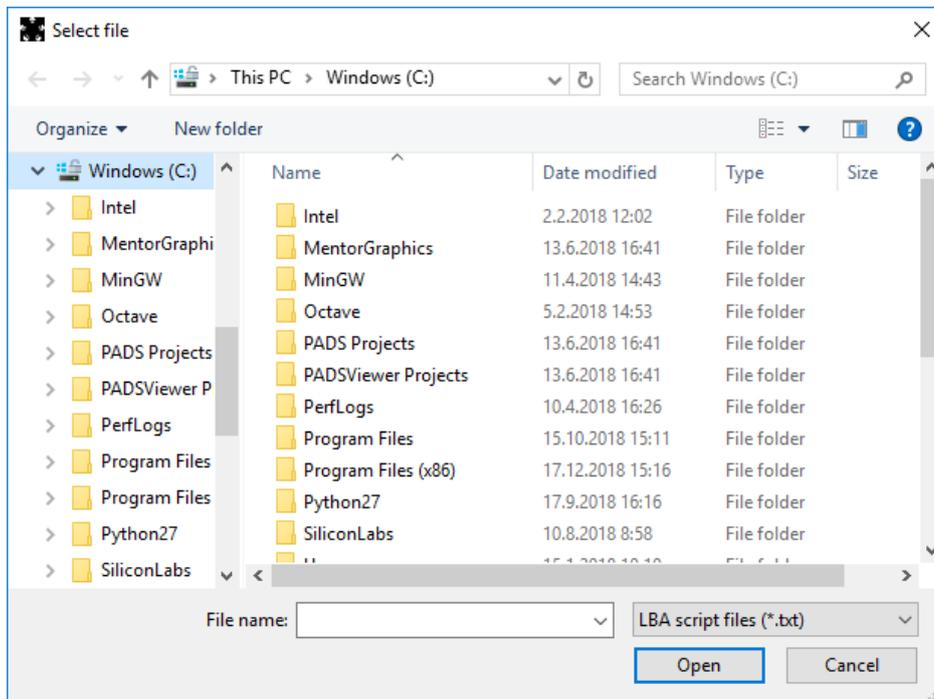
Figure 5. Script file selection dialog.

After opening the file LLA will compile the script file to suitable transmit format. After successful processing following confirmation dialog is shown. Click Yes to proceed.

Beneq Oy
Olarinluoma 9   Tel. +358 9 7599 530   VAT ID FI19563372
FI-02200 Espoo   Fax +358 9 7599 5310   www.beneq.com
Finland   lumineq@beneq.com   www.lumineq.com

Date: October 2, 2019   Document number: ED001499B   Page | 6
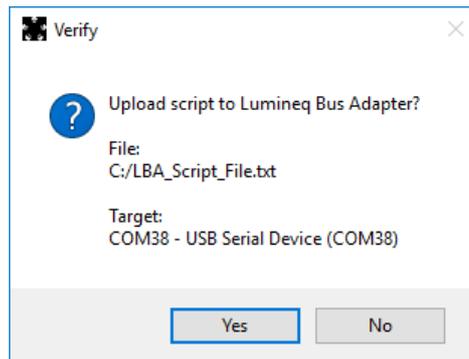
Figure 6. Script upload confirmation screen.

In case of communication error following dialog is shown. In such case make sure that the USB cable is properly connected and try again. If the problem still exists, make sure that no other devices using Cypress USB IDs are connected to the PC. If the problem still exists after disconnecting other devices using Cypress USB ID, it may be that LBA is running incompatible firmware variant.
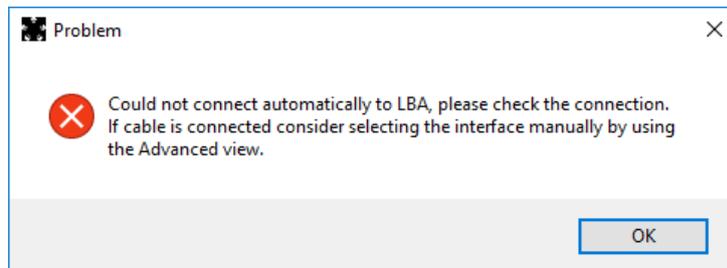
Figure 7. Communication problem. Check connection and try again.

Once the upload operation is completed successfully, following end dialog is shown. LBA will start script execution after the dialog is acknowledged. However, if script contains SYNC or TRIGGER command (dual LBA cases), USB disconnection and full power-off power-on cycle is required.
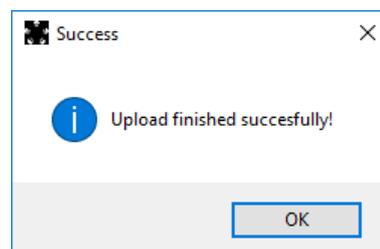
Figure 8. Script upload end screen.

If the USB cable is disconnected or the upload process is interrupted in any other mean the upload can always be restarted.

Beneq Oy
Olarinluoma 9
FI-02200 Espoo
Finland

Tel. +358 9 7599 530
Fax +358 9 7599 5310
lumineq@beneq.com

VAT ID FI19563372
www.beneq.com
www.lumineq.com

Date: October 2, 2019   Document number: ED001499B   Page | 7

3.2 Advanced View

The Advanced view mode is intended to be used as a troubleshooting tool in case of any problems. Connection to LBA must be established manually.

Select source script file using the "Open script" button. Upload file to LBA by clicking the "Send script" button. Note that if the file is modified it must be reopened before uploading.

Advanced view also provides functionality for

- Checking the SW version of Core (the common software component of all LBA applications) and App version (the script sequence runner)

- Script memory area data CRC validation

- Manual erase of script memory area.

The Advanced view window can be seen in Figure 2.

4 Syntax guide

This chapter demonstrates the usage of supported script commands. Lines starting with # or content between /# and #/ tags are comments and not related to the actual command. Commands listed in this chapter are supported by Lumineq Loader version 1.0.0.

Few words about the generic implementation:

– Case-insensitive implementation allows mixing upper- and lower-case letters

– Space and tab-based indentation to improve readability of script

– Single and multiline commenting for improved readability and deactivation of script commands

– Additive approach to updating register values eliminates the need of continuous repetition. Especially useful with ON and OFF command-based animations.

– Delay defines the time in milliseconds of how long is waited until the next command in script is executed

– Commands without delay in their syntax are followed immediately by the next command in script

– Once the last command in script has been reached the script is restarted from the beginning. Remember always to initialize all necessary values at the beginning of the script

– When referencing to a port use the label found next to the matching port connector as shown in Figure 9.
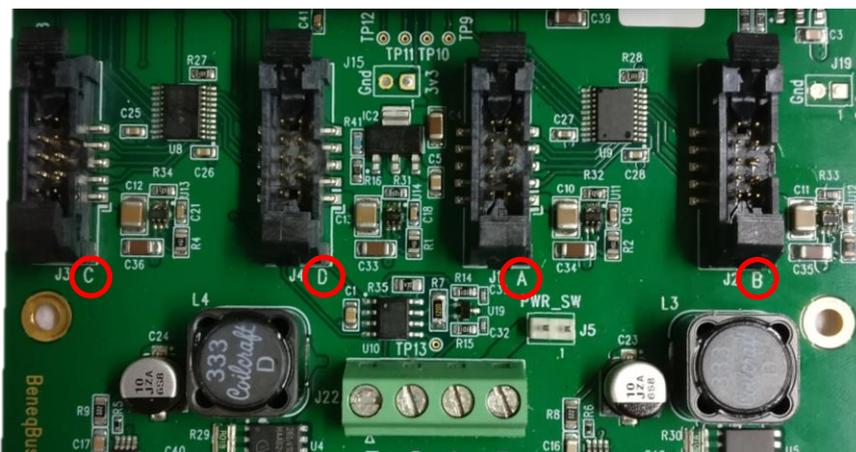
Figure 9. Port label location guide. From left to right, port C, D, A and B.

4.1.1 On – lit segment

Functionality:	Lit segment.
Syntax:	on, delay, target;
Description:	Command sets segment on in an additive way leaving rest of the segments in state they were before the command. Command is chainable and target may contain segments from one or multiple ports.
Usage:	# Turn on all segments on every port on, 1000; # Turn on all segments on port A and proceed to next command after 1 second on, 1000, a; # Lit segment 1 on ports A, B, C and D on, 1000, a1, b1, c1, d1; # Lit segment 1 on ports A, B, C and D in chained mode on, 0, a1; on, 0, b1; on, 0, c1; on, 1000, d1; # Make sure that all other segments are off and lit only segment 1 in display connected to LBA port A: off, 0; on, 1000, a1;

4.1.2 Off – unlit segment

Functionality:	Unlit segment.
Syntax:	off, delay, target;
Description:	Command sets segment on in an additive way leaving rest of the segments in state they were before the command. Command is chainable and target may contain segments from one or multiple ports.
Usage:	# Turn off all segments on every port off, 1000; # Turn off all segments on port A and proceed to next command after 1 second off, 1000, a; # Unlit segment 1 on ports A, B, C and D off, 1000, a1, b1, c1, d1; # Unlit segment 1 on ports A, B, C and D in chained mode off, 0, a1; off, 0, b1; off, 0, c1; off, 1000, d1; # Make sure that all other segments are lit and unlit only segment 1 in display connected to LBA port A: on, 0; off, 1000, a1;

4.1.3 Skip

Functionality:	Command display driving electronics not to update certain segments. Disabling unused segments enables higher display frame rate and luminance by increasing the frame rate frequency. Frame frequency must not be set above the display-specific maximum frame frequency. A frame frequency beyond this value might damage the display and/or display electronics. Note that disabled segments increase the actual frame rate frequency beyond the actual frequency value set using f-command and/or flist-command. For more information refer to display driving electronics operating manual (ELT40S Electronics Operation Manual).
Syntax:	skip, target;
Description:	Command modifies register value in an additive way leaving rest of the configuration in state before the command. Target may contain segments from one or multiple ports.
Usage:	# Skip segment 1 on display connected to port A skip, a1;

4.1.4 Unskip

Functionality:	Command display driving electronics to update certain segments.
Syntax:	unskip, target;
Description:	Command modifies register value in an additive way leaving rest of the configuration in state before the command. Target may contain segments from one or multiple ports.
Usage:	# Unskip segment 1 on display connected to port A unskip, a1;

4.2   Port control command

4.2.1 F – frequency

Functionality:	Command display driving electronics to drive display using given frequency.
Syntax:	f, port, value;
Description:	Command is port specific and can be applied only to one port per time. Use raw decimal value when defining the target frequency. The display frame frequency (*FR*) can be calculated as follows according to ELT40S Electronics Operating Manual: $$F_p = 3\,000 - \frac{200\,000}{F_f}$$ where F_f = Frame frequency F_p = Programmable value. **Frequency** **Value (Decimal number)** **Notes** 200 Hz 2000 Default brightness 500 Hz 2600

	Note that possible segment skipping will affect the final driving frequency. For more information refer to display driving electronics operating manual (ELT40S Electronics Operation Manual).
Usage:	# Drive port A with frequency of 200 Hz f, a, 2000;

4.2.2 FLIST – adjusting display brightness

Functionality:	Allow adjusting display frequency using Aux1 board in script mode
Syntax:	flist, port, f1, f2, f3, f4, f5, f6, f7, f8, f9, f10;
Description:	Usage of this command will enable Aux1 interface. Connect encoder to port J17. Command is port specific and can be applied only to one port per time. Script can contain 10 different frequency levels in total. The last value in list is taken in use in default. If less than 10 values are provided in the script, the application will automatically limit the span to match the amount of given values. At start up f10 will be taken in use. Rotating the Aux1 encoder anti-clock-wise will change the frequency to f9. Each port can be configured to use different frequency list. It is recommendable to use the command only once in the script. Place it at the very beginning. In dual mode the change in encoder position is passed to secondary LBA. In such case both primary and secondary LBA scripts must both contain frequency lists.
Usage:	# 5 different brightness/frequency levels for display on port A flist, a, 100, 500, 1500, 2000, 2800; # 5 different brightness levels for ports A and B, limit lower frequency of ports C # and D to frequency matching 2000 dec raw value. flist, a, 100, 500, 1500, 2000, 2800; flist, b, 100, 500, 1500, 2000, 2800; flist, c, 2000, 2800; flist, d, 2000, 2800;

4.2.3 V – voltage

Functionality:	Command display driving electronics to drive display using given voltage. Command is port specific and can be applied only to one port per time. THIS COMMAND MUST NOT BE USED
Syntax:	v, port, value;
Description:	Command is port specific. Use raw decimal value when defining the target voltage. For more details refer to ELT40S Electronics Operation Manual. THIS COMMAND MUST NOT BE USED
Usage:	# Drive port A with voltage of X. v, a, x;

Beneq Oy
Olarinluoma 9   Tel. +358 9 7599 530   VAT ID FI19563372
FI-02200 Espoo   Fax +358 9 7599 5310   www.beneq.com
Finland   lumineq@beneq.com   www.lumineq.com

Date: October 2, 2019   Document number: ED001499B   Page | 12

4.3 System commands

4.3.1 Push

Functionality:	Halt script execution and continue after button press.
Syntax:	push;
Description:	To be used with Auxiliary 1 board. Allows executing script in a view by view manner. View is changed when rotary encoder on Aux1 board is pressed down and released immediately. If button is kept pressed down script execution proceeds as normal, i.e. without being halted. FLIST based brightness adjusting is fully operational during the time. Note that if PUSH command is followed by ON or OFF command, the latter should have long enough period time to allow button return up. Otherwise the push is interpreted as long press. In other words, button debounce time is controlled by the duration of next command in script. As the script is executed line by line it is not possible to accelerate the execution by pushing and releasing the button quickly as the button status is read only when execution has reached corresponding line in script.
Usage:	# Light segment A1 for 500 ms on, 500, a1; # Wait until button is pressed push; # Light segment A2 for 500 ms on, 500, a2; # Wait until button is pressed, turn all segments off for 1 ms and jump back to beginning push; off, 1;

4.3.2 Wait

Functionality:	Halt script execution for given time and do nothing.
Syntax:	wait, delay;
Description:	
Usage:	# Wait for 300 ms wait, 300;

4.3.3 Trigger

Functionality:	Configure target LBA as Primary unit in dual drive mode and synchronize script execution of two LBA units driving common display.
Syntax:	trigger;
Description:	To be used in situation where 2 LBA units are driving together a same display. Position command to the very beginning of the script file. Command is device specific and usually used only once. Using this command more than once in the script will improve timing precision but can cause a phase drift in Primary and Secondary LBA script execution. Secondary LBA unit script must have similar script structure than the Primary LBA unit. Secondary LBA script must have SYNC command in matching location with Primary LBA's TRIGGER command.

Beneq Oy
Olarinluoma 9
FI-02200 Espoo
Finland

Tel. +358 9 7599 530
Fax +358 9 7599 5310
lumineq@beneq.com

VAT ID FI19563372
www.beneq.com
www.lumineq.com

Date: October 2, 2019   Document number: ED001499B   Page | 13

	Required wiring:
	  – Primary J12.2 to Secondary J12.2
	  – Primary J9.2 to Secondary J8.2
	
	In case of synchronization problem due to hardware connection problem or software issue, the Secondary unit will proceed with script execution. Once the synchronization signal is properly routed the units will continue executing the scripts in sync.

Usage:	# Synchronize Primary and Secondary LBA script execution trigger;

4.3.4 Sync

Functionality:	Configure target LBA as Secondary unit in dual drive mode and synchronize script execution of two LBA units driving common display.
Syntax:	sync;

Description:	To be used in situation where 2 LBA units are driving together a same display. Position command to the very beginning of the script file. Command is device specific and usually used only once. Using this command more than once in the script will improve timing precision but can cause a phase drift in Primary and Secondary LBA script execution.
	
	Primary LBA unit script must have similar script structure than the Secondary LBA unit. Primary LBA script must have TRIGGER command in matching location with Secondary LBA's TRIGGER command.
	
	Required wiring:
	  – Primary J12.2 to Secondary J12.2
	  – Primary J9.2 to Secondary J8.2
	
	In case of synchronization problem due to hardware connection problem or software issue, the Secondary unit will proceed with script execution. Once the synchronization signal is properly routed the units will continue executing the scripts in sync.

Usage:	# Synchronize Primary and Secondary LBA script execution sync;

5 Quick Start Guide

```
##################################################
# Lumineq Loader Application - Sample Input Script #
#                                                 #
# This sample contains examples and              #
# introduction to most commonly used commands.   #
##################################################

/# Lines starting with # are single line comments. Multi-line comments, such as
this block, are also supported. Command line must always end to semicolon (;)#/

# Perform self-test by setting on all segments of every port for 1 s
on, 1000;

# Don't care about case sensitivity, content is what matters
OfF, 1;

# Set segments A1, B1 and C1 on for 200 ms
on, 200, a1, b1, c1;

# Now set segments A1 and C1 off, B1 remains on
off, 100, a1, c1;

# Commands can be spread on multiple lines and intended as well
# for better readability
on, 100,
        a1, a2,
        b1, b2,
        c1, c2;

/#
Comments can be spread as well over multiple lines
off       a1, a2, # Comments can also include comments
        b1, b2,
        c1, c2;
#/

f,a,200; # Adjust frequency of ELT40 on port A. Note that this is the raw
value, not frequency.

# On & Off and Skip & Unskip commands can be chained as following way:
on, 0, A;  # For 1 second, set all segments of port A on...
off, 1000, A40; # ... except A40.

# End of the script. Execution returns to first line.
```

6 Document Version Control

Version	Date	Change list
1.1	1.10.2019	Added new command "PUSH".
1.0	6.8.2019	Released